WHAT WE CLAIM IS:

1. A bipolar high power battery device, comprising:
   a) at least one group of n stackable electrochemical energy storage cells (20), connected in series, the energy storing cells (20) having:
      - a lithium ion insertion cathode (26) on a current collector substrate (21; 22) and a lithium ion insertion anode (24) on a current collector substrate (21; 22), with an anode-to-cathode capacity ratio r;
      - a separator material (34) associated between the anode (24) and the cathode (26); and
      - an electrolyte system (36);

   wherein $2 \leq n \leq 50$ and $0.6 \leq r \leq 1.3$;

   b) a leak-proof seal structure (51);
   c) means (63) for voltage monitoring of subgroups of m storage cells (20) connected in series,
   where $2 \leq m \leq 10$ and $m \leq n$; and
   d) means (81) for keeping the battery under compression.

2. The device according to claim 1, wherein the anode (24) includes a lithiated titanium oxide.

3. The device according to claim 2, wherein the lithiated titanium oxide is of the spinel type.

4. The device according to one of claims 1 to 3, wherein the cathode (36) includes a lithium manganese oxide.

5. The device according to claim 4, wherein the lithium manganese oxide is of the spinel type.

6. The device according to one of claims 1 to 5, wherein the cathode (26) comprises a lithium insertion material having a dopant selected from the group consisting of B, Al, Mg, Ca, Zn, Fe, Mn, Ni, Co, and Cr.

7. The device according to one of claims 1 to 6, wherein $0.6 \leq r < 1$.

8. The device according to one of claims 1 to 7, wherein both the anode (24) and the cathode (26) have a porosity between 30 % and 60 % each.

9. The device according to one of claims 1 to 8, wherein the device additionally comprises at least one conductive primer layer (40), wherein the conductive primer layer (40) is positioned between at least one of the anode (24) and the adjacent current collector (21; 22) and the cathode (26) and the adjacent current collector (21; 22).

10. The device according to one of claims 1 to 9 having a charge and discharge capability of at least 0.04 A/cm^2 for more than 60s.

11. The device according to one of claim 1 to 10, wherein the compression means (81) comprises a mechanical compression device.

12. The device according to one of claims 1 to 11, wherein the level of compression is between 0.02 MPa and 1 MPa.

13. The device according to one of claims 1 to 12, wherein the electrolyte system (36) comprises a nonaqueous electrolyte system.

14. The device according to claim13, wherein the electrolyte system (36) comprises a lithium-based salt selected from the group consisting of $LiPF_6$, $LiBF_4$, $LiN(SO_2CF_3)_2$, $LiN(SO_2C_2F_5)_2$, $LiC(SO_2CF_3)_3$, $LiClO_4$, $LiAsF_6$, lithium bisoxalatoborate and other lithium borates.

15. The device according to claim 14, wherein the concentration of the lithium-based salt is between 1.0 and 1.6 M.

16. The device according to claim 14 or 15, additionally comprising at least one electrolyte solvent, wherein the at least one solvent associated with the electrolyte is selected from the group consisting of propylenecarbonate, ethylenecarbonate, diethylcarbonate, dimethylcarbonate, ethyl-methylcarbonate, gamma-butyrolactone, ethylacetate, ethylbutyrate, ethylpropionate, methylbutyrate, 1,2-dimethoxyethane, 1,2-diethoxyethane, 2-methoxyethylether, methoxypropionitrile, valeronitrile, dimethylacetamide, diethylacetamide, sulfolane, dimethysulfite, diethysulfite, trimethylphosphate and ionic liquids.

17. The device according to one of claims 1 to 16, wherein the electrolyte system (36) has a conductivity of at least 8 mS/cm at 25 °C.

18. The device according to one of claims 1 to 17, wherein the seal structure (51) comprises at least one polymer selected from the group consisting of thermoplastic polymers, thermoplastic ionomers, duroplastic polymers, and resins.

19. The device according to one of claims 1 to 18, wherein the seal structure (51) comprises at least one layer of barrier material, associated with the device in a hermetic way.

20. The device according to claim 19, wherein the barrier material consists of a composite comprising at least one heat-sealable layer, one barrier layer, and one additional insulating layer.

21. The device according to one of claims 1 tp 20, wherein the seal structure (51) may provide a section for each cell where gas can accumulate or be absorbed by getters.

22. The device according to claim 1, comprising:
    a) at least two groups of n_1 to n_z stackable electrochemical energy storage cells (20), connected in series within each group, the cells having:
        - a lithium ion insertion cathode (26) on a current collector substrate (21; 22) and a lithium ion insertion anode (24) on a current collector substrate (21; 22), with an anode-to-cathode capacity ratio r;
        - a separator material (34) associated between the anode (24) and the cathode (26); and
        - an electrolyte system (36);

    where z is any integer, $2 \leq n_i \leq 50$, $1 \leq i \leq z$, and $0.6 \leq r \leq 1.3$;
    b) a leak-proof seal structure (51);
    c) means (63) for voltage monitoring of subgroups of m cells connected in series where $2 \leq m \leq 10$ and $m \leq n_i$; and
    d) means (81) of keeping the battery device under compression.

23. The device according to claim 22, wherein the at least two groups of n_1 to n_z stackable electrochemical energy storage cells (20) are configured in any combination of series and parallel connections.

24. The device according to claim 23, wherein all n_1 to n_z numbers are identical.

25. The device according to one of claims 1 to 24, wherein the stackable electrochemical energy storage cells (20) are electrically connected by contacting means (82).

26. The device according to claim 25, wherein contacting means comprise a conductive sheet of material (82) held in place and providing electrical contact to and in-between device end plates (60', 60'') by the means (81) for keeping the battery device under compression.